

# ASSIGNMENT 2

Handout: **Tuesday, 4 October 2016**

Due: **11:30 am, Thursday, 13 October 2016**

**Assignment 1.2 is already extended and included here as Assignment 2.2.  
No need to hand in Assignment 1.2.**

## GOALS:

- Understand better the importance of information hiding;
- Design and implement Java classes;
- Get used to the IntelliJ Idea IDE;

## 1. RATIONAL NUMBERS

In mathematics, a rational number is any number that can be expressed as the quotient or fraction  $p/q$  of two integers, a numerator  $p$  and a non-zero denominator  $q$ . Since  $q$  may be equal to 1, every integer is a rational number.

-- Wikipedia

Write a Java class for rational numbers. The class should have

1. two fields of type `int`, one for the numerator and the other for the denominator;
2. a constructor with two parameters, for the numerator and denominator respectively;
3. two methods called `add` and `multiply` respectively; Both methods take another rational number as parameter, do the calculation using `this` and the parameter rational numbers, and return the result rational.
4. an `asString` method which returns the string representation of `this` in the form `numerator/denominator`.

## WHAT TO DO: IN RATIONAL.JAVA

**Task 1:** add the missing fields to class `Rational`;

**Task 2:** complete the constructor, method `add`, method `multiply`, and method `asString`;

**Task 3:** create `Rational` objects in the `main` method, add or multiply them, and print the results out to see if they are correct.

## WHAT TO HAND IN:

`Rational.java`

## 2. COMPLEX NUMBERS

A complex number is a number that can be expressed in the form  $a + bi$ , where  $a$  and  $b$  are real numbers and  $i$  is the imaginary unit, that satisfies the equation  $i^2 = -1$ . In this expression,  $a$  is the real part and  $b$  is the imaginary part of the complex number.

-- Wikipedia

Write a Java class for complex numbers, but with both the real and the imaginary parts of type `Rational`. The class should have

1. two fields of type `Rational`, one for the real part and the other for the imaginary part;
2. a constructor with two parameters, for the real and the imaginary part respectively;
3. two methods called `add` and `multiply` respectively; Both methods take another complex number as parameter, do the calculation using `this` complex and the parameter, and return the result complex.
4. an `asString` method which returns the string representation of `this` in the form `(real, imaginary)`.

### WHAT TO DO: IN COMPLEX.JAVA

**Task 4:** add the missing fields to class `Complex`;

**Task 5:** complete the constructor, method `add`, method `multiply`, and method `asString`;

**Task 6:** create `Complex` objects in the `main` method, add or multiply them, and print the results out to see if they are correct.

### WHAT TO HAND IN:

`Complex.java`